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ABSTRACT

The purpose of the study was to determine if captions displayed on instructional video programs interfere with learning in hearing audiences. Eighty hearing undergraduate students enrolled in lower division education classes were randomly assigned to one of two groups. Each subject completed a questionnaire to collect self-report data on sex, age, major, knowledge of computers, number of computer classes taken, and attitude toward computers. Subjects then viewed a 30-minute captioned instructional program on computers. Subjects in group 1 viewed the program with both captions and sound, while subjects in group 2 viewed it without the captions displayed. After viewing, subjects were tested on the content of the program and asked to fill out a post questionnaire to assess their attitudes toward captions and the viewing of captioned materials in an instructional setting. Data were analyzed using t-tests and chi-squares on selected preliminary questionnaire data, and multivariate analysis of variance was used to analyze data on computer knowledge, computer attitude, the posttest score, and post questionnaire data. Contrary to the supposition that captions are distracting and would interfere with learning, data on interference indicate that there was no significant difference between the groups in the mean score on the test of knowledge. The survey of attitude revealed that there was also no significant difference between the groups in their attitudes toward captions. (Author/MES)

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Impact of Television Captioning on Hearing Audiences

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Abstract

The purpose of the study was to determine if captions displayed on instructional video programs interfere with learning in hearing audiences. Eighty undergraduate students enrolled in lower division education classes at a university were randomly assigned to one of two groups. All subjects in the study were drawn from a hearing population. Prior to the viewing of the video, each subject completed a questionnaire to collect self-report data on sex, age, major, knowledge of computers, number of computer classes taken, and a series of questions to determine the subject's attitude towards computers. Following the preliminary questionnaire, subjects viewed a 30-minute captioned instructional program on computers. Subjects in group 1 viewed the program with both captions and sound, while Ss in group 2 viewed it without the captions displayed. After viewing, Ss in each group were tested on the content of the program. Following completion of the test, Subjects were asked to fill out a post questionnaire designed to assess the Subject's attitude toward captions and the viewing of captioned materials in an instructional setting. Data from the study was analyzed using t-tests and chi-squares on select preliminary questionnaire data. Multivariate analysis of variance (MANOVA) was used to analyze the data on computer knowledge, computer attitude, the posttest score, and post questionnaire data. The data on interference indicate that, contrary to the supposition that captions are distracting and hence would interfere with learning, there was no significant difference between groups in the mean score on the test of knowledge. The survey of attitude revealed no significant difference between groups on attitude toward captions.

INTRODUCTION

Televised instructional materials, whether produced specifically for the classroom or obtained from commercial sources, are used regularly in instruction. Many of these programs are captioned for the hearing-impaired. Would the viewing of these programs with the captions showing (as subtitles) interfere with the learning process of students who do not have a hearing problem? The purpose of this study was to determine if captions displayed on instructional video programs interfere with learning in hearing audiences so that media managers can make appropriate decisions and plan the allocation of resources to best serve an entire instructional program. Captions have not been used with hearing audiences because, as the National Captioning Institute (NCI) points out, "many viewers without hearing impairments find ordinary subtitles, called open captions, distracting" (Farrell, 1984). There is no research currently available that investigates this question. If captions are found to cause genuine interference in the learning process a case can be made for adequate funding to create and staff separate viewing facilities for the hearing impaired. If, on the other hand, captions are found not to interfere with learning, media managers can then direct their resources towards the showing of captioned materials in regular classes when hearing-impaired students are present. In either case, both the letter and spirit of Public Law 504, which requires that all students be provided equal access to educational opportunities, will be met because the decision will have been based upon research rather than suppositions.

REVIEW OF THE LITERATURE

There appears to be no research that deals directly with captioning and its effect upon a normal hearing audience. Captioning, as a service to assist the hearing-impaired, has benefited from improvements in technology and, as a result, many hours of captioned programming are now available through the closed-captioning technique. The National Captioning Institute has

developed standards by which most programming is captioned; however, the considerations employed in the captioning process are based on research conducted with the hearing-impaired, most of whom have been children. Consequently, it is not uncommon to see the captions either precede or follow the audio portion of a program. Furthermore, captions are targeted at not more than a sixth grade reading level and often substitute vocabulary or delete words for readability and timing purposes.

Captions have been shown to improve learning when viewed by the hearing-impaired (Gates, 1970; Fischer, 1971; Nix, 1971; Davila, 1972; Boyd and Vader, 1972; Nomeland, 1972); however, reading level influences the degree to which a hearing-impaired viewer, aged 8-18, comprehends the content of the captions (Braverman, 1981). Since all of the research was directed at the hearing-impaired, it has limited application to the investigation of possible interference with a normal hearing audience.

A recent study has shown that captions have been successful in teaching English as a Second Language to normal hearing students (Price, 1983), and some research is currently being conducted on the effectiveness of captioning in the teaching of reading (Caption, 1984). Still, no one has shown that captions interfere with learning in a normal, hearing audience.

Text has become commonplace on television and all viewers "read" television to varying degrees. Thousands of words per week are found in news and sports programs and in commercials (Peters, 1980); however, this use of text bears little resemblance to captioning.

Research on the ability of television to teach reading has been directed toward children and occurred primarily before the growth and development of the closed captioning process. In addition, none of the studies uses captions, per se, as part of the treatment. The research of Broadbent (1958) and Travers (1964) indicates that the rate of transmission of audio-visual material determines the extent to which a subject can simultaneously process information received through more than one sense or modality. At rates greater than 200 words per minute, subjects tended to block one channel. The experiments which were conducted used still pictures

and were dependent upon simultaneous transmission of pictures and sound. In contrast, closed-captioned television employs moving pictures and, because it is produced for the hearing-impaired, is not concerned with the precise synchronization of dialogue and captions. Furthermore, captioned television transmits information in what can be considered three channels--two visual and one aural. Processing information received through these three channels simultaneously may itself cause interference.

Researchers have become more aware of the uses of text on television and have suggested that educators pay more attention to the instructional potential it offers not only to children but to adults as well (Peters, 1979,1980; Kinnamon, 1975; Adams and Harrison, 1975; Feeley, 1975). This is particularly important since the origination of regularly scheduled closed-captioned television in 1980. The research that has been conducted which relates to closed-captioned television deals primarily with the hearing-impaired viewer. This is understandable in view of the fact that closed-captioning was created for a hearing-impaired audience; however, the time has come to conduct inquiries into the potential benefit that captioning may hold for the non-hearing-impaired viewer. This study represents the foundation of that inquiry by first establishing whether or not viewing an instructional program with both sound and captions creates an unacceptable distraction for the normal hearing viewer.

In order to accomplish this, the following questions were asked:

- 1) Does captioning interfere with the learning of hearing students when viewing an educational video presentation?
- 2) Will there be any difference in students' attitudes toward captioning following the viewing of a captioned educational video presentation?

METHOD

Subjects

Eighty university students, representing 31 different majors, enrolled in 5 undergraduate general education classes were randomly assigned to one of two groups of 40 subjects. All subjects in the study were drawn from a hearing population.

Materials

A 30-minute instructional videotape was selected from the telecourse, *The New Literacy*, produced by the Southern California Consortium for Community College Television and captioned by the National Captioning Institute. A 35-item test on the content of the program was developed from the telecourse test materials and a series of questions contained in the teacher's manual provided with the permission of the Southern California Consortium for Community College Television. Each question on the test was identified as belonging to one of four test item levels created by the course authors. The four level taxonomy and the number of test questions at each level was as follows: Level 1, nine questions representing recall of facts; Level 2, twelve questions requiring the recall of implications or interpretations; Level 3, eight questions requiring the application of facts, implications, or interpretations to new situations; and Level 4, six questions requiring a subject to make judgments or decisions about something not specifically covered previously. Prior to conducting the study, the test was administered to a randomly selected group of 25 subjects who did not view the video presentation. This group served as a control for the test itself. Subjects in this group achieved a mean score of 16.80 which would later be compared with the mean scores of the Caption and Non-Caption groups in the study to establish that the test was a measure of knowledge gained from viewing the video presentation.

A 12-item self-report preliminary questionnaire was designed to collect data on each subject's sex, age, knowledge of computers, and current major. A 16-item Likert-scaled postquestionnaire was developed to assess the subject's attitude toward captions and the viewing of captioned materials in an instructional setting. Both questionnaires were created by the researcher.

Procedure

Prior to the viewing of any video, Ss completed the self-report questionnaire. After filling out the questionnaire, Ss viewed a 30-minute instructional program captioned by the National Captioning Institute. Ss in Group 1 viewed the program with both captions and sound while Ss in Group 2 viewed it with sound only.

After viewing the program, Ss in each group were tested on the content of the program. Following completion of the test, Ss in both groups were asked to complete the Likert-scaled attitudinal survey consisting of a series of statements regarding captions.

RESULTS

The caption-interference study represents a Posttest Only Control Group Design. Data analysis on the posttest was conducted using two MANOVAs, one conducted on the test taxonomy levels scores and one conducted on the posttest score and post questionnaire data (i.e., attitude toward hearing impaired). Factor analyses were used to analyze the attitude data obtained from the post questionnaire prior to conducting the MANOVA.

Analysis of Posttest Data

Posttest data was analyzed using two separate multivariate analyses of variance (MANOVAs) to determine if there were any differences between groups after treatment. Included in the first MANOVA was the test level taxonomy; while the second contained the data

on posttest score and selected data from the post questionnaire. The results of the MANOVA on the posttest score and post questionnaire data will be reported in a separate section following the discussion of the post questionnaire data analysis.

As a final assessment of the ability of the posttest to measure knowledge gain attributable to the viewing of the instructional video program, the posttest scores of the group which took the test without viewing the video was compared to the posttest scores of the Caption and Non-Caption groups.

Results of Oneway ANOVA on Posttest Scores of Control, Caption and Non-Caption Groups. In order to establish the test as measure of knowledge gained from viewing the instructional video program, it was administered to a randomly selected group of 25 subjects who did not view the instructional video. A One Way Analysis of Variance (ANOVA) was conducted to test for mean differences among the 3 groups (Caption, Non-Caption, and Control) for posttest score. This analysis included 2 preplanned contrasts which were as follows: 1) The combined means for caption and non-caption groups were contrasted with the mean for the Control group; 2) The mean for the Caption group was contrasted with the mean for the Non-Caption group.

The results of the ANOVA on Score by 3 Groups (Table 1) revealed a significant difference among groups ($F=36.45$; $df=2/104$; $MS=439.51$; $p<.001$). The pre-planned contrast showed a significant difference between the combined means for Caption and Non-Caption groups when contrasted with the mean for the Control group ($t=8.49$; $df=102$; $p<.001$) (Table 2). The contrast between the means for the Caption and Non-Caption groups (Table 3) indicated no significant difference between the groups ($t=.93$; $df=102$; $p>.05$).

TABLE 1

ANOVA Summary Table: Score X 3 Groups (Caption, Non-Caption and Control)

Source	Ss	df	MS	F	p
Between Groups	879.01	2	439.51	36.45	.0000*
Within Group	1230.04	102	12.06		
Total	2109.05	104			

*p<.001

TABLE 2

Results of pre-planned Contrast #1: Mean Scores Posttest for Caption/Non-Caption vs Control

Contrast #1	Mean Score	T Value	df	p
Caption/Non-Caption	25.51	8.49	102	.000*
Control	16.80			

*p<.001

TABLE 3

Results of pre-planned Contrast #2: Mean Scores Posttest for Caption vs Non-Caption Groups

Contrast #2	Mean Score	T Value	df	p
Caption	25.88	.93	102	.353
Non-Caption	25.15			

*p<.001

These findings support the statement that the test was a measure of knowledge gained from viewing the instructional video.

Results of MANOVA on Posttest Taxonomy. A MANOVA was conducted to test for mean differences in the four dependent variables, Levels One through Four, for the two groups (Captioned and Non-Captioned). Results of the MANOVA showed no overall difference for these variables (Wilk's lambda =.95, exact $F_{4,75}=.924$, $p=.454$).

Results of Attitude Questionnaire

In order to determine attitude toward captions all subjects completed a 16-item questionnaire following the posttest. The questionnaire (see Appendix C) included items regarding distraction created by captions, preference for captions, response to captions, effect of captions, and the response to use of captions with hearing-impaired students in a class. In order to decrease a subject's sensitization to the captioning issue, four neutral items were included in the questionnaire. These items dealt primarily with the sound and picture quality of the program.

Factor analyses. Subject's attitude toward captioning was analyzed using SPSS subprogram FACTOR, method PA1 (principal factor analysis without iterations) to extract initial factors. Following this an orthogonal VARIMAX Rotation was applied to the resulting factor matrix. The factor analysis was conducted in order to determine the number of constructs in the attitude survey instrument. This was accomplished by removing the four neutral items from the 16-item attitudinal survey, and then performing the factor analysis on the remaining 12 items. After VARIMAX rotation, an analysis which centers on simplifying the columns of a factor matrix, two factors were revealed (Table 4) when using a criteria value of .4. Of the twelve remaining questions, nine were clearly related to a subject's attitude towards the captioning of instructional video programs without regard to the hearing-impaired--which the researcher called a general factor (Factor 1), and three were concerned with the viewing of captioned video programs in an instructional setting taking into consideration the hearing-impaired population--which the researcher called a segregation factor (Factor 2). The "general factor" group was comprised of a series of nine statements with which the subject indicated his/her degree of

agreement ranging from strongly agree to strongly disagree with five choices for each item. The statements included such comments as: "Captions on instructional television programs are not distracting; I object to seeing an instructional video program with the captions displayed; Captions reinforce the content of a program", etc. The three "segregation factor" statements clearly made reference to the hearing-impaired.

TABLE 4

Analysis of Attitudinal Survey after Removal of Neutral Items: Coefficient Matrix for Principal Factor Analysis with an Orthogonal Varimax Rotation

Attitude Questions	Factor 1	Factor 2
1 Captions not distracting	.77131*	-.00596
2 Prefer viewing with captions	.81815*	-.02690
4 Captions interfere w/enjoyment	.57015*	.20609
5 Captions interfere w/learning	.64473*	.36592
7 Captions decrease learning	.70179*	.31207
8 Object to captions displayed	.72513*	.30720
9 Captions reinforce content	.76931*	.00277
11 Separate viewing, hearing-impaired	.19793	.67553*
12 Captions increase learning	.75747*	.01758
13 Captions interfere with content	.59792*	.36133
14 Object captions, hearing-impaired	.08756	.74203*
16 Separate facilities worthwhile	-.00270	.74680*

*Criteria for Interpreting Factor=.4

As a measure of internal consistency Cronbach alpha coefficients were computed for both the general and segregation factors of the attitude survey. The alpha for the general factor was .887 which indicates a high degree of consistency in the statements which comprised that factor. The alpha for the segregation factor was .632, indicating only moderate consistency. One explanation for the latter reliability coefficient may be that the segregation factor is comprised of only three items whereas the general factor is made up of 9 items. The greater number of items in the general construct allows for greater accuracy in statistical analysis.

Results of MANOVA on Posttest and Attitude Factors

A Multivariate Analysis of Variance (MANOVA) was performed using the following variables: posttest score, general factor, and segregated factor by group. Using the Wilk's multivariate test of significance, no significant difference was found in the MANOVA on the selected variables (Wilk's $\lambda=.93$, exact $F_{3,76}=1.91$, $p=.135$).

DISCUSSION

These data indicate that, contrary to the supposition that captions are distracting and hence would interfere with learning, there was no significant difference in the mean score on the test of knowledge between subjects in this study who viewed the instructional video presentation with captions displayed and a similar group of subjects who viewed the identical video presentation without the captions displayed. Furthermore, when taking into consideration the four taxonomy levels in the test of knowledge, no significant differences between groups were found at any level. The nonsignificant findings cannot be explained away by suggesting that the test was not a measure of knowledge gained as a result of viewing the video presentation since both groups scored 25.83 and 24.98 respectively as compared to the test control group mean score of 16.80.

This finding calls into question the current practice of excluding the hearing-impaired from the regular classroom experience when captioned video programs are shown in classes without the captions displayed. It should not prevent media managers from establishing, funding, and staffing separate viewing facilities for the hearing impaired, but when limited funds are available, managers should consider the allocation of their resources to support mainstreaming activities.

The survey of attitude toward captions on instructional video presentations revealed no significant differences between the captioned and non-captioned group. In this instance, factor analysis identified two constructs in the attitudinal survey. No difference was found between

groups on the general construct; however, the segregation construct which dealt with how students felt about viewing captioned instructional materials when a hearing-impaired student was present in the class approached significance ($p < .069$). This may be attributed to empathy subjects in the experimental group may have after actually experiencing a video presentation with captions showing.

As a management question this study presented a worst case scenario for interference when captions are shown in an instructional setting, and it closely replicates the occasional use that instructional video has in higher education. Further research should be conducted with other subject matter, different levels of learners, and learners with special requirements. In addition, where a series of video presentations are used repeatedly in the same class, research should be conducted on the effect of captioned material over time. This study, however, should provide managers with a reasonable reference when attempting to reconcile mainstreaming requirements and financial constraints.

REFERENCES

- Adams, Anne H and Cathy B. Harrison. "Using Television to Teach Specific Reading Skills," *The Reading Teacher*, 29:45-51, October, 1975.
- Boyd, J. and E. A. Vader. "Captioned Television for the Deaf," *American Annals of the Deaf*, 117:34-37, 1972.
- Braverman, Barbara. "Television Captioning Strategies: A Systematic Research and Development Approach," *American Annals of the Deaf*, 126:1031-1036, December, 1981.
- Broadbent, D. E. *Perception and Communication*. London: Pergamon Press, 1958.
- Caption*, p. 3, Fall, 1984.
- Fischer, D. C. *Improvement in the Utilization of Captioned Films for the Deaf*. Unpublished doctoral dissertation, University of Nebraska, 1971.
- Davila, R. *Effect of Changes in Visual Information Patterns on Student Achievement Using a Captioned Film and Specially Adapted Still Pictures*. Unpublished doctoral dissertation, Syracuse University, 1972.

- Farrell, June M. "The National Captioning Institute," *NCI News*, Falls Church, Va.: National Captioning Institute, August 18, 1983.
- Freeley, Joan T. "Television and Reading in the Seventies," *Language Arts*, 52:797-801+, September, 1975.
- Gates, R. "The Reception of Verbal Information by Deaf Students through a Television Medium--A Comparison of Speechreading, Manual Communication, and Reading." *Proceedings of the Convention of American Instructors of the Deaf*, Little Rock Arkansas, 1971, 513-522.
- Kinnamon, Sue E. and JR Staff. "Commercial Television and Adult Reading," *Journal of Reading*, 18:470-474, March 1975.
- Nix, G. W. *The Effect of Synchronized Captioning on the Assimilation of Vocabulary and Concepts Presented in a Film to Intermediate Level Deaf Children*. Unpublished doctoral dissertation, University of Oregon, 1971.
- Nomeland, R. E. *The Effects of Inserts and Captions on Learning with Deaf Students Using Motion and Still Pictures*. Unpublished doctoral dissertation, Syracuse University, 1973.
- Peters, F. J. J. "Printed Messages in American Commercial Television and the Reading Teacher," *Journal of Reading*. 22:408-415, February, 1979.
- . "Reading Television," *Reading World*, 20:113-118, December, 1980.
- Price, K. "Closed-Captioned TV: An Untapped Resource," *MATSOL Newsletter*, 12:1+, Fall, 1983.
- Travers, Robert M. W. "The Transmission of Information to Human Receivers," *Communication Review*, 12:373-385, Winter, 1964.